Draft Report

Description of Current Texas Transportation Mobility and Maintenance Needs

prepared for

Texas Department of Transportation

prepared by

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Executive Summary

Over the next 25 years, the Texas population is expected to grow by 41 percent to 31.8 million by 2030. The economy will grow even faster at an annual rate of 2.9 percent, with total Gross State Product (GSP), a measure of state economic activity, reaching nearly $1.7 trillion by 2030. This population and economic growth will drive demand for passenger and freight transportation in coming decades. By 2030, registered vehicles in Texas are expected to increase by almost 98 percent from 18.0 million in 2000 to 35.5 million. Similarly, average annual vehicle miles traveled (VMT) on Texas roadways are expected to increase 70 percent by 2030, reaching 368 billion annually.

Increasing demand on the Texas transportation system will require substantial investment in the coming decades. Cambridge Systematics (CS) conducted a needs assessment by mode to estimate the investment required to deliver an acceptable level of service to each element of the Texas transportation system. We estimate that an investment of $15.9 billion for highways, $1.2 billion for public transportation, $637 million for freight rail, $255 million for marine transportation, and $1.0 billion for commercial and noncommercial aviation will be required *each year* through 2030 to meet the state's multimodal transportation needs.

While the magnitude of transportation needs in Texas is great, the state continues to lead the nation in the pursuit of innovative transportation funding solutions. If Texas can meet its transportation needs, the state stands to recoup its investment through enhanced economic development activities and improved competitive advantages. Texas' transportation funding and financing initiatives will also serve as examples to other states struggling with their own transportation issues. As an executive director of a Texas Metropolitan Planning Organization (MPO) stated:

> *Transportation is our future. We cannot let the system reach gridlock and expect our economy to remain strong. We need a strong voice to communicate our problems and brainstorm solutions that can enable us to catch up with demand and invest in transportation infrastructure to sustain our growth (May 2008).*

Developing comprehensive mobility and maintenance solutions to meet the state's transportation needs requires timely action by state legislators, informed by participation from regional, city, and local leaders. To promote and sustain its future economic vitality, Texas must plan for ways to expand its multimodal transportation network to handle the expected growth in population and international trade.

1.0 Introduction

The Texas Department of Transportation (TxDOT) Government and Public Affairs (GPA) Division commissioned Cambridge Systematics, Inc. (CS) to describe the current and future needs of the Texas transportation system, both in terms of mobility and maintenance. The results of this report provide an immediate assessment of the state's mobility and maintenance needs and set the context for a qualitative discussion on the impact of transportation investment to the state's economy and quality of life.

TxDOT, working with Texas Transportation Institute (TTI) and the Center for Transportation Research (CTR), is preparing supporting research designed to complement the qualitative results of this report. This report presents a summary of the types and extent of transportation improvement needs across the state that addresses population growth, increasing transportation usage, and aging infrastructure. We also present a commentary on the contributing factors that affect existing and future transportation needs and the importance of continued transportation investment needed to sustain the Texas economy and quality of life as perceived by Texas business and community leaders. This commentary will be useful in setting the context for the more detailed needs assessment being developed by CTR and TTI. We have organized the report as follows:

- **Section 2.0, Literature Review**, summarizes statewide transportation planning documents, needs assessment studies, and mobility reports that estimate existing and future transportation capacity and maintenance needs throughout the state.
- **Section 3.0, Demographic, Socioeconomic, and Industry Data and Trends**, synthesizes demographic, socioeconomic, and industry data to describe the key trends and factors driving the needs for transportation investment in Texas.
- **Section 4.0, Statewide Needs Assessment,** estimates the annual investment needs to 2030 for each mode of the Texas transportation system.
- **Section 5.0, Texas Business and Community Leader Interviews**, summarizes perspectives of business owners, chambers of commerce, and transportation planning agencies on how transportation mobility affects the Texas economy and quality of life and the future consequences of failing to meet mobility and maintenance needs.
- **Section 6.0, Summary and Conclusion**, summarizes the study findings and identifies potential next steps.
- **Section 7.0, Bibliography and Sources**, provides links to datasets, planning reports, and other sources used to develop this comprehensive description of Texas' transportation needs.

2.0 Literature Review

Cambridge Systematics (CS) conducted a literature review of statewide transportation planning documents, needs assessment reports, and mobility studies that estimate both existing and expected future transportation capacity and maintenance needs throughout the state. This literature review provides the context for a qualitative discussion of the types and extent of transportation improvements needed across the state. The findings of this literature review helped shape subsequent data collection efforts and stakeholder interviews conducted for this study and reported in Sections 3.0 and 5.0.

Results of the literature review include summaries of:

- Findings of the mobility plans prepared by the Metropolitan Planning Organizations (MPOs) throughout the state;
- Mobility needs identified in two sequential reports prepared by the Governor's Business Council;
- Long-range transportation plans and needs assessment strategies previously prepared by TxDOT; and
- Other academic research, focusing on needs in rural areas.

2.1 Metropolitan and Urban Mobility Plans

Financially-constrained Metropolitan Transportation Plans (MTPs) are Federally required for each MPO, and are used to prioritize projects based on what a region can afford, not what it actually needs. In 2003, TxDOT unveiled the *Texas Metropolitan Mobility Plan* (TMMP), requiring the state's eight major metropolitan areas (Austin, Corpus Christi, North Central Texas (Dallas-Fort Worth), El Paso, Lubbock, Hidalgo County (Lower Rio Grande Valley), Houston-Galveston, and San Antonio) to prepare a long-range, *needs-based* assessment of the transportation projects required to reduce congestion, improve mobility, and address transportation-related quality-of-life factors in their regions (TxDOT 2003). The Texas Transportation Commission approved the TMMPs from the eight major metropolitan areas in 2006 and 2007. The TMMPs quantify the additional transportation capacity needed to reduce congestion to locally acceptable levels.

Table 2.1 summarizes the estimated funding needs outlined in each TMMP by transportation system component. The TMMPs use lane-mile equivalents as a generic measure of future unmet travel demand in the region, identifying the additional roadway lane miles that the metropolitan area would theoretically need to meet future demand.

Table 2.1 Transportation System Needs to 2030 Identified in the Texas Metropolitan Mobility Plans (in millions of 2006 dollars)

Metropolitan Area	Roadway/Lane-Mile Equivalent	Rehabilitation	ROW	Transit	Other[a]	Total
Austin	$10,200	$9,000	$4,700	$1,300	$2,300	$27,500
San Antonio	7,300	7,900	700	n/a[b]	n/a[b]	15,900
Houston	36,300	49,900	3,400	23,100	33,700	146,400
Dallas-Fort Worth	46,200	35,600	1,100	8,300	23,700	114,900
Rio Grande Valley	2,200	500	n/a[b]	n/a[b]	n/a[b]	2,700
El Paso	5,400	2900	400	n/a	1,700	10,400
Lubbock	1,100	100	n/a[b]	500	n/a[b]	1,700
Corpus Christi	1,900	2,200	200	n/a[b]	500	4,800

a Other costs include other itemized transportation system components listed in the TMMPs, such as operations and maintenance, congestion mitigation strategies, bridges, bicycle and pedestrian facilities, safety, freight rail, and intelligent transportation systems (ITS).

b TMMP does not specifically quantify need for this transportation system component.

Source: TMMPs from Capital Area MPO (2006), San-Antonio-Bexar County MPO (2007), Houston-Galveston Area Council (2006), North Central Texas Council of Governments (2006), Hidalgo County MPO (2006), El Paso MPO (2006), Lubbock MPO (2006), and Corpus Christi MPO (2006) adjusted to 2006 dollars.

The mobility plans quantify the additional lane miles needed in the region to reduce congestion to an acceptable level by 2030. While "additional lane miles needed" provide a representation of overall need, the MPOs recognize that mobility solutions should incorporate a combination of multimodal approaches, including freeways, toll roads, HOV and arterial street improvements, bus and rail transit, intermodal freight connectivity, and operational system improvements. To help meet the mobility needs of their region, Texas MPOs will continue to expand the use of innovative finance tools, implement operational strategies to improve the function of existing transportation infrastructure, and consider non-transportation and land-use strategies.

In 2003 the Texas Legislature passed HB 3588 requiring each of the 17 smaller MPOs in Texas to develop a comprehensive Texas Urban Mobility Plan (TUMP) to quantify the long-range needs of their regions. The 17 smaller metropolitan areas include Abilene, Amarillo, Beaumont-Port Arthur, Brownsville, Bryan-College Station, Harlingen-San Benito, Killeen-Temple, Laredo, Longview, Midland-Odessa, San Angelo, Sherman-Dennison-Howe, Texarkana, Tyler,

Victoria, Waco, and Wichita Falls. The TUMP process is on-going and several MPOs have adopted mobility plans that identify their region's unmet transportation needs. However, because a comprehensive set of TUMPs is not yet available, CS did not consider these documents during this analysis.

2.2 GOVERNOR'S BUSINESS COUNCIL

In early 2003, the Governor's Business Council (GBC) completed *Texas' Roadways – Texas' Future: A Look at the Next 25 Years of Roadway Supply, Demand, Cost, and Benefits*, an analysis of the mobility needs in the state's largest metropolitan areas and the importance of transportation to the Texas economy. The study quantified the 25-year transportation needs in terms of the number of additional lane-miles needed to maintain particular congestion scenarios within five Texas areas: Dallas/Fort Worth, Houston, San Antonio, Austin, and the Texas Border region. The GBC estimated that state and local governments need to make a $178.6 billion investment (in 2000 dollars) over the next 25 years to maintain present levels of congestion in the five regions, while $218.3 billion would be required to reduce congestion to acceptable levels (Texas GBC 2003).

In 2006, the GBC completed a follow-up study entitled, *Shaping the Competitive Advantage of Texas Metropolitan Regions*. The goal of this study was to align the GBC analysis processes with those used by the MPOs in the TMMPs, reconcile the transportation need estimates provided within the original GBC study and the TMMPs of the eight largest metropolitan areas, and evaluate different funding solutions to resolve the shortfall. In the 2006 study, the GBC found that the state's eight largest metropolitan areas would require $66 billion in roadway expenditures in addition to the $120 billion available from currently identified sources over the next 25 years to reach a desirable congestion level target (Texas GBC 2006). Consequently, a $66 billion investment would return $541 billion in economic benefits from fuel cost and travel time savings, enhanced business efficiencies, and construction stimuli.

While the primary focus of both GBC studies was on the need for highway-oriented travel (in terms of additional lane-miles needed), both concluded that mobility solutions must include new road capacity, better traffic management, and technological advances. They further recommended that transportation projects be evaluated based on their ability to relieve congestion and improve the region's mobility ratings within an acceptable target. Finally, the GBC studies also called for a change in state and Federal policies to ensure that metropolitan areas do not lose funding because they succeed in reducing congestion.

2.3 TXDOT'S LONG-RANGE TRANSPORTATION PLANNING

In 1994 TxDOT completed *The Texas Transportation Plan* (TTP), a 20-year long-range transportation plan that outlined needs and strategies to meet the transportation goals of the state. It included a highway needs assessment to

determine the funding required to improve the state's highway system to a satisfactory level of service. The TTP cited $134 billion (in 1992 dollars) in total highway and bridge needs between 1995 and 2014, or approximately $6.7 billion in highway construction and maintenance needs per year during the 20-year period.

The TTP also presented a needs analysis for bus transit serving the elderly and disabled, rural and non-urbanized areas, and small municipalities. Approximately $2.1 billion for small urban, rural, and demand-responsive transit would be required over the 20-year planning period (in 1992 dollars). The 1994 TTP did not include needs assessments of the other transportation modes.

2.4 ACADEMIC RESEARCH

We also identified several research studies that provided additional insight into Texas' statewide transportation improvement needs. A CTR study, *Transportation Challenges and Issues Facing Rural Texas: A Methodology to Prioritize Rural Transportation Needs*, focused on the transportation needs of rural Texas. It found that the traditional project prioritization methods that are largely based on traffic volumes are not adequate to maintain such a large rural network. Due to the transfer of agricultural commodities from rail to truck over the last several decades, the rural network is in need of maintenance and rehabilitation because it was not designed to carry the heavy loads. The study concluded that the rural network should be re-evaluated and possibly reclassified to focus scarce resources on the most heavily traveled and economically important roadway links. Data collection in rural areas should be improved to allow for more efficient targeting of resources (CTR 2007).

Another study prepared by TTI, *The 2007 Urban Mobility Report*, provides estimates of annual delay per traveler and wasted fuel per traveler in the country's urban areas. This report shows that congestion in Texas cities is getting worse, reducing the reliability and efficiency of the state's transportation system. The report also outlines the benefits to reducing congestion and potential congestion-mitigation strategies. We discuss the findings of the TTI congestion study in further detail in Section 3.0.

3.0 Demographic, Socioeconomic, and Industry Data and Trends

CS collected and synthesized data and information to describe the key trends and factors driving the needs for transportation investment in Texas. We collected data and identified trends in two categories:

1. **Demographic and socioeconomic trends** describe historical, current, and forecasted patterns of population growth and distribution within the state, identify changes in household income and prosperity, and describe how these changes impact travel patterns and use of the transportation system; and
2. **Industry trends** describe links between transportation efficiency and economic competitiveness, as well as the statewide, national, and international supply chain and distribution trends that are feeding freight demand in the state.

The following sections summarize the demographic, socioeconomic, and industry data and trends in Texas.

3.1 Demographic and Socioeconomic Data and Trends

Population

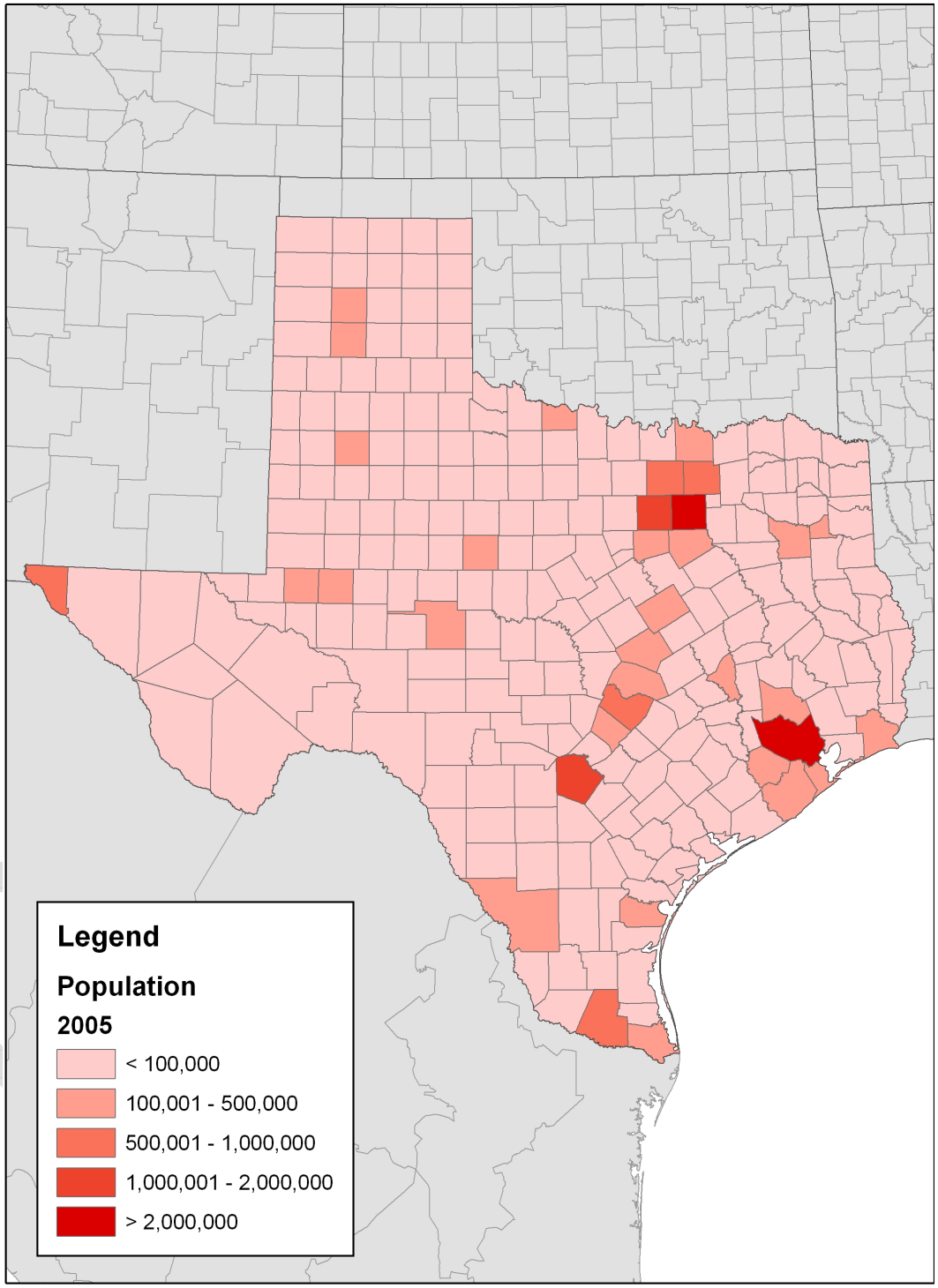
Texas is a large, rapidly growing state. Texas had the eighth fastest growing state population in the country between 1990 and 2000, growing by 22.8 percent and adding 3.8 million people over that period. This growth represents more than 10 percent of the nation's total population increase of 32.7 million people. Between 2000 and 2007, Texas' population increased again by nearly 3 million people, bringing the total population to over 22.5 million people in 2005 (Texas State Data Center). The Texas State Data Center projects the population to increase by 41 percent to 31.8 million between 2005 and 2030.[1]

Population growth in Texas is concentrated in the state's cities which are being significantly impacted by congestion, mobility, and air quality problems. More than 87 percent of Texans live in the state's metropolitan statistical areas (MSAs)-regions in the state with urbanized area populations of at least 50,000 and metropolitan populations of at least 100,000. Between 2000 and 2007, more than 96 percent of the state's population growth occurred in the MSAs. The top five

[1] Population projections based on Scenario 0.5 prepared by the Texas State Data Center.

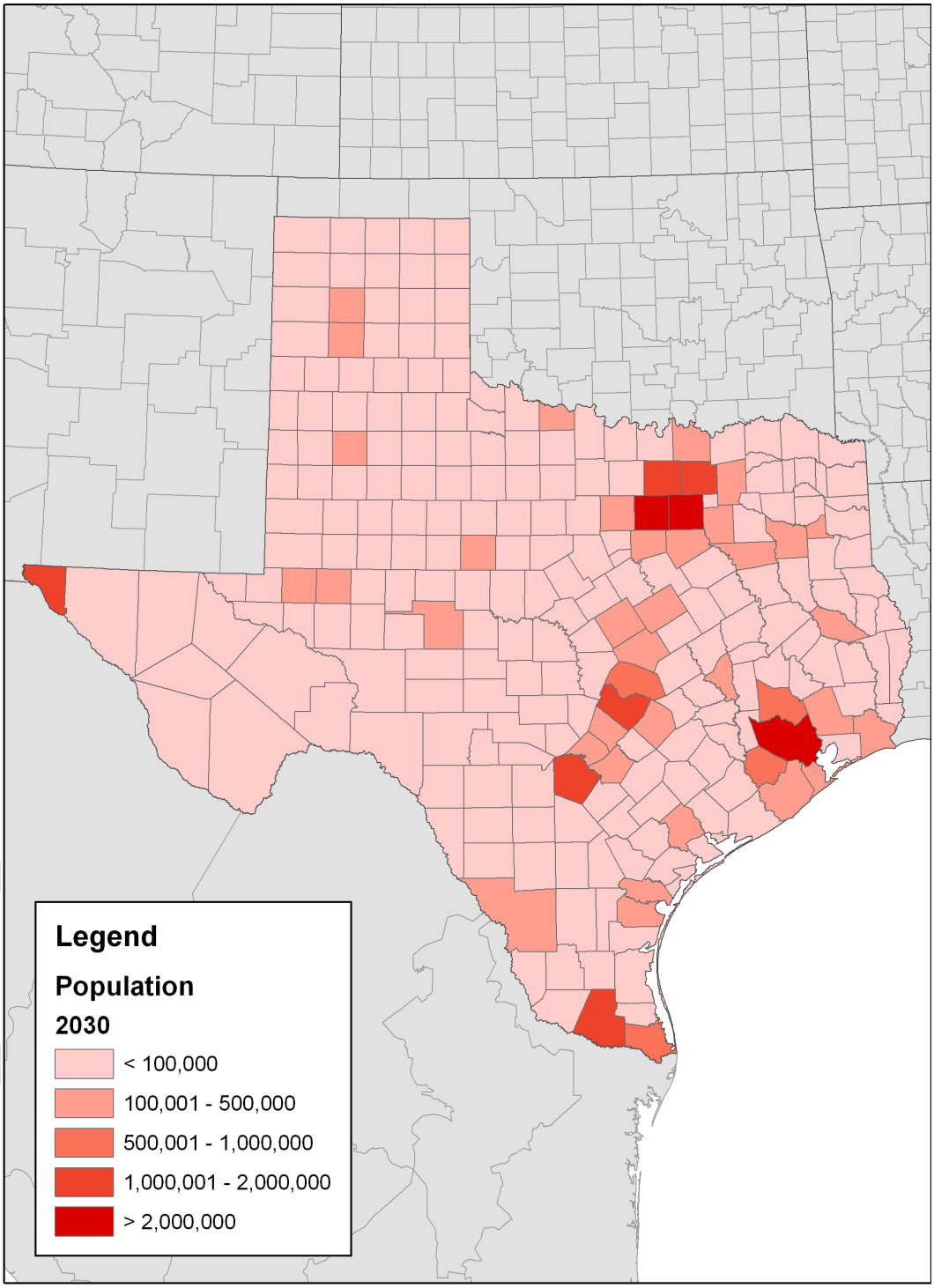
metropolitan areas alone accounted for 67 percent of the increase (Texas State Data Center). Figure 3.1 and 3.2 illustrate 2005 and 2030 population by county, respectively. Forecasts indicate growth will continue to be concentrated in the state's major metropolitan areas, particularly within the "Texas Triangle" (the Houston-Dallas-San Antonio corridor, which includes Austin) and the border counties.

Figure 3.1 2005 Population by County



Source: Texas State Data Center

Figure 3.2 2030 Population by County



Source: Texas State Data Center, Scenario 0.5.

Gross State Product

Similar to population, the Texas economy has also experienced rapid growth. Overall, the state's economy expanded by 80 percent from 1990 to 2005, as Gross State Product (GSP), a measure of state economic activity, grew from $462 billion to nearly $832 billion (in constant 2000 dollars) (Texas Comptroller 2007). Table 3.1 shows historic, current, and projected economic growth without impacts of inflation.

Table 3.1 GSP by Industry

1990 to 2030 (Billions of Year 2000 Dollars)

Industry Sector	1990	1995	2000	2005	2030
Goods-Dependent	**$200.23**	**$255.05**	**$337.30**	**$389.17**	**$746.19**
Agriculture	4.40	4.31	6.47	7.48	6.80
Mining (Oil and Gas)	49.27	58.04	45.18	40.13	29.52
Construction	22.51	26.65	36.88	37.00	72.17
Manufacturing	47.25	64.56	92.98	124.97	331.70
Trade/Transportation/Utilities	76.80	101.50	155.79	179.59	305.99
Services	**$261.77**	**$300.14**	**$389.93**	**$442.61**	**$939.01**
Information	14.88	21.24	35.87	44.49	86.47
Financial Activities	80.08	88.68	117.20	125.34	228.63
Professional and Business Services	41.90	49.39	73.21	93.91	305.45
Educational and Health Services	31.49	35.65	42.36	52.64	103.28
Leisure and Hospitality	15.13	17.69	23.11	24.88	52.07
Other Services	14.29	16.16	17.60	16.52	21.42
Government	63.99	71.32	80.59	84.83	141.68
Total Texas GSP (Billions, 2000 Dollars)	**$462.00**	**$555.19**	**$727.23**	**$831.79**	**$1,685.20**

Source: Texas Comptroller of Public Accounts Data, Fall 2007 Forecast.

Note: The components of the chain weighted real dollar values do not necessarily sum to the category totals due to the methods used in calculating the chained 2000 dollars.

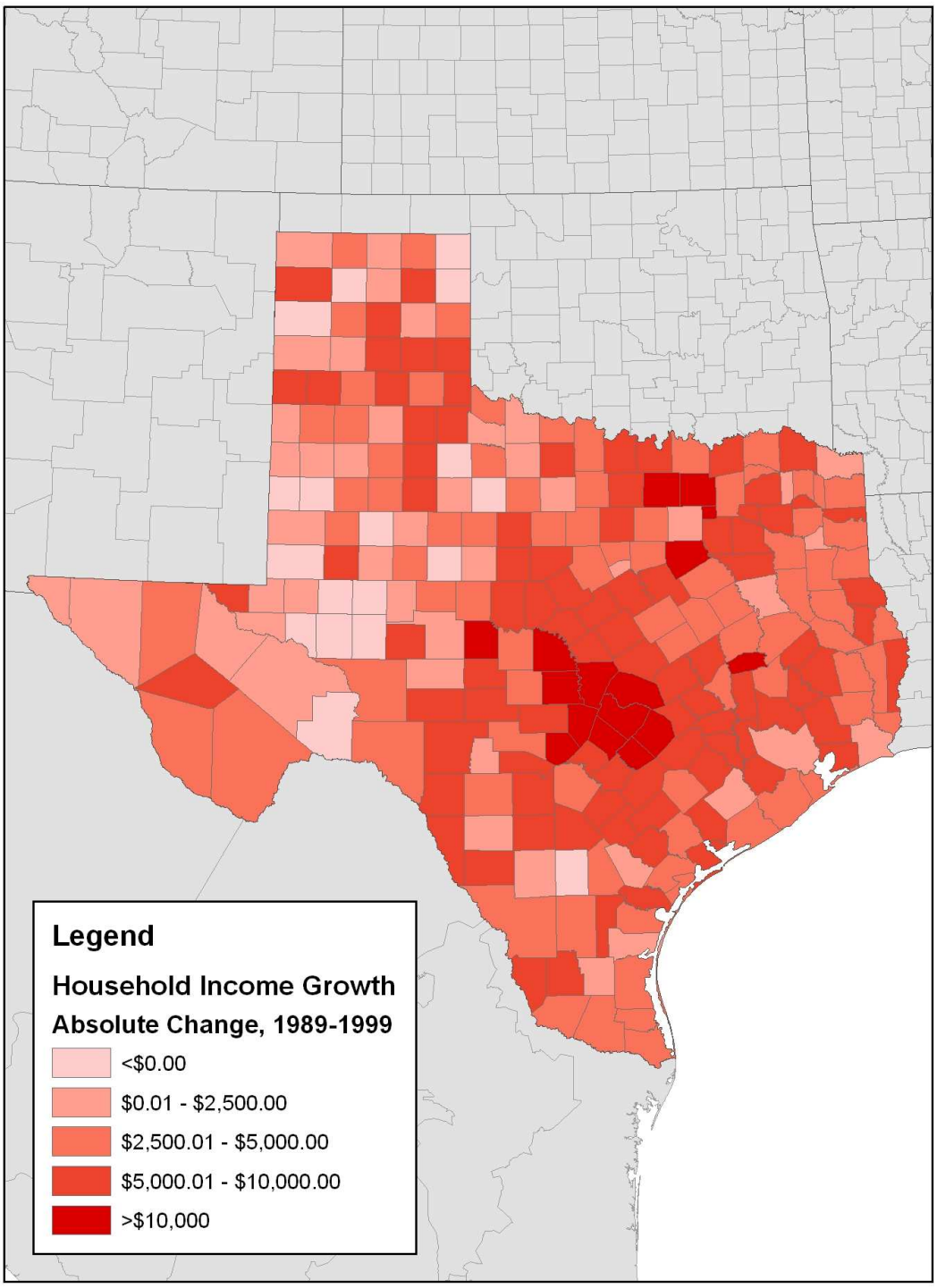
Robust growth is expected to continue into the future, with total GSP reaching nearly $1.7 trillion by 2030. The manufacturing sector and the professional and business services sector are expected to have the highest rates of growth through 2030, growing 165 percent and 225 percent, respectively, over the next 25 years. During this same period, the economic outputs from the agriculture and mining sectors are expected to experience a decline. Between 2005 and 2030, forecasts indicate agriculture will decline by nine percent, while mining is expected to decrease by 26 percent. Growth in all other industry sectors, however, far outweighs the decline in the two goods-dependent sectors, leading to strong

economic growth projections into the future. We present more analysis of Texas' industry trends in Section 3.2.

Household Income

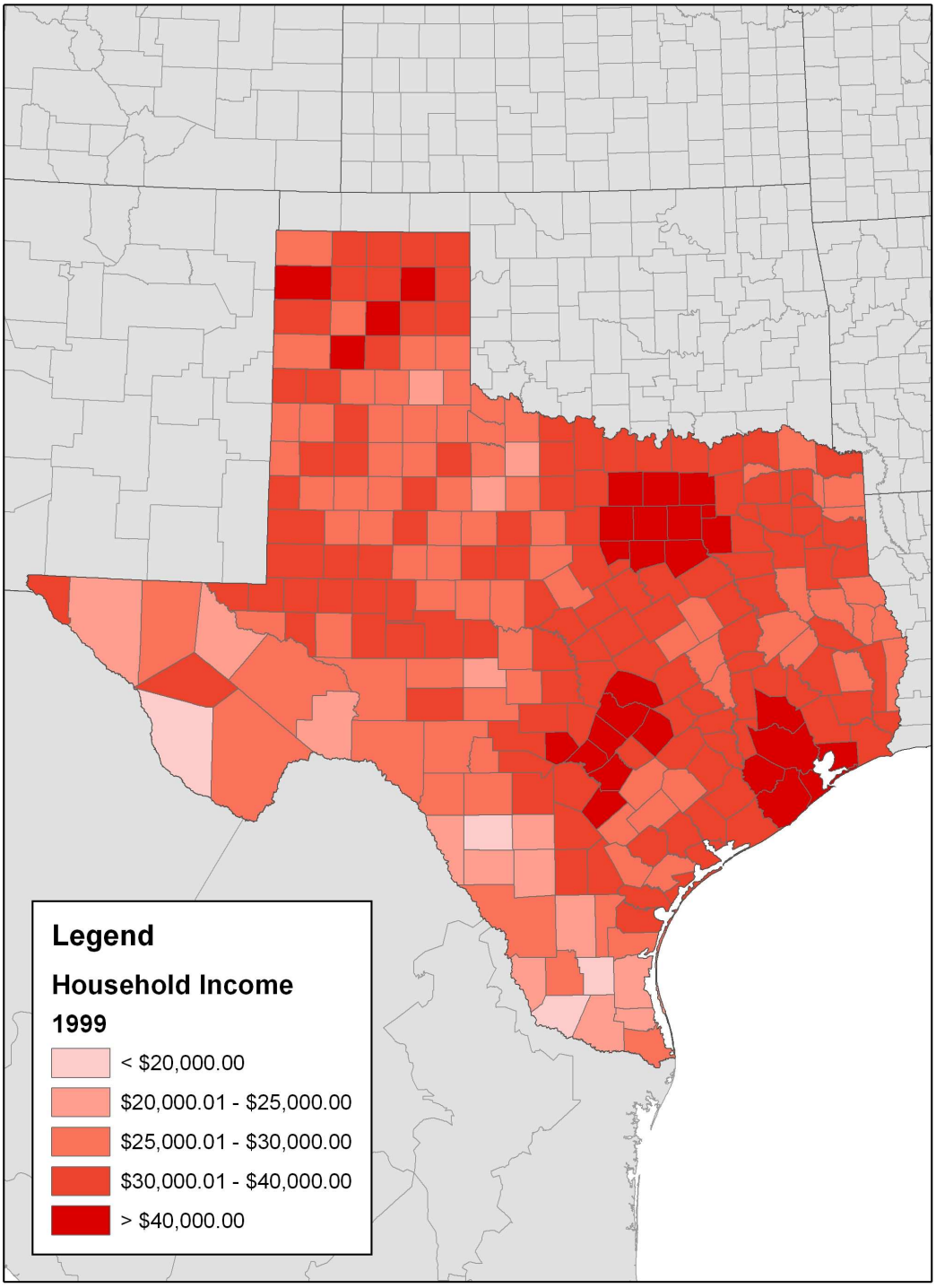
Increases in household income have accompanied the growth in GSP. Median household income in Texas grew by 13.9 percent from 1989 to 1999 (in constant 1999 dollars). Central Texas, in particular, experienced rapid income growth driven by the high-technology boom of the 1990s (Figure 3.3). Although median household income in Houston did not grow at the same magnitude as growth in Central Texas between 1989 and 1999, the Houston metropolitan area already had some of the highest household incomes in the state (Figure 3.4).

Figure 3.3 Median Household Income Growth by County
1989 to 1999



Source: Texas State Data Center.

Figure 3.4 1999 Median Household Income by County

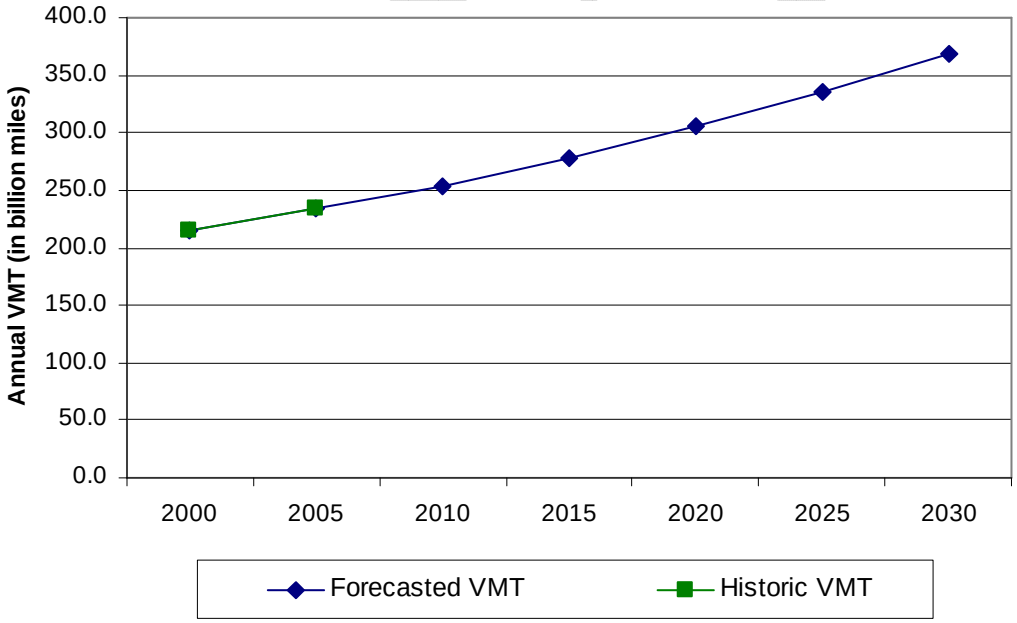


Source: Texas State Data Center.

Vehicle-Miles Traveled

Increases in income and prosperity lead to increases in vehicle ownership and vehicle-miles traveled (VMT). Between 2000 and 2005, the number of registered motor vehicles in Texas increased by 6.3 percent (TxDOT Pocket Facts). By 2030, registered vehicles in Texas are expected to increase by almost 98 percent from 18.0 million in 2000 to 35.5 million in 2030. Similarly, VMT on Texas roadways continues to increase. The average annual VMT on all state roadways in 2005 was 234.2 billion, representing a nine percent increase over the VMT in 2000 (TxDOT Pocket Facts). If historical trends continue and the VMT in Texas continues to increase by approximately two percent each year, Texas is expected to experience a 70 percent increase in VMT by 2030 with 368 billion VMT annually (Figure 3.5).

Figure 3.5 Historic and Forecasted Average Annual VMT on All State Roadways



Source: TxDOT Pocket Facts 2001-2007 and Cambridge Systematics.

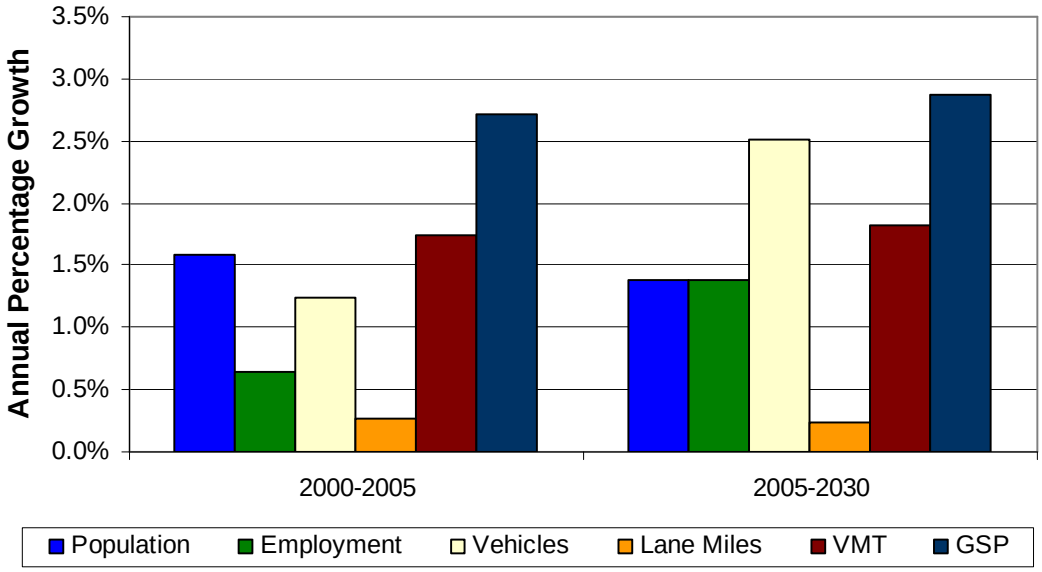
Transportation Impacts

Growth in population, income, and prosperity places greater demands on the transportation system. However, roadway capacity enhancements have not kept up with this growing demand. There are more than 300,000 centerline miles and 650,000 lane miles in the Texas roadway system, including Interstates, U.S. highways, state highways, Farm or Ranch to Market roads, frontage roads, county roads, city streets, and toll roads. During the 15 years from 1992 to 2006, VMT in Texas grew approximately 10 times faster than lane miles added to the system. VMT increased by more than 50 percent during this period, while the number of lane miles grew by just 5.1 percent (Federal Highway Administration

(FHWA) Highway Statistics). Figure 3.6 depicts the growth in population, GSP, employment, registered vehicles, total lane miles, and VMT. While all metrics show annual growth, infrastructure investment in the form of additional lane miles has experienced the slowest growth.

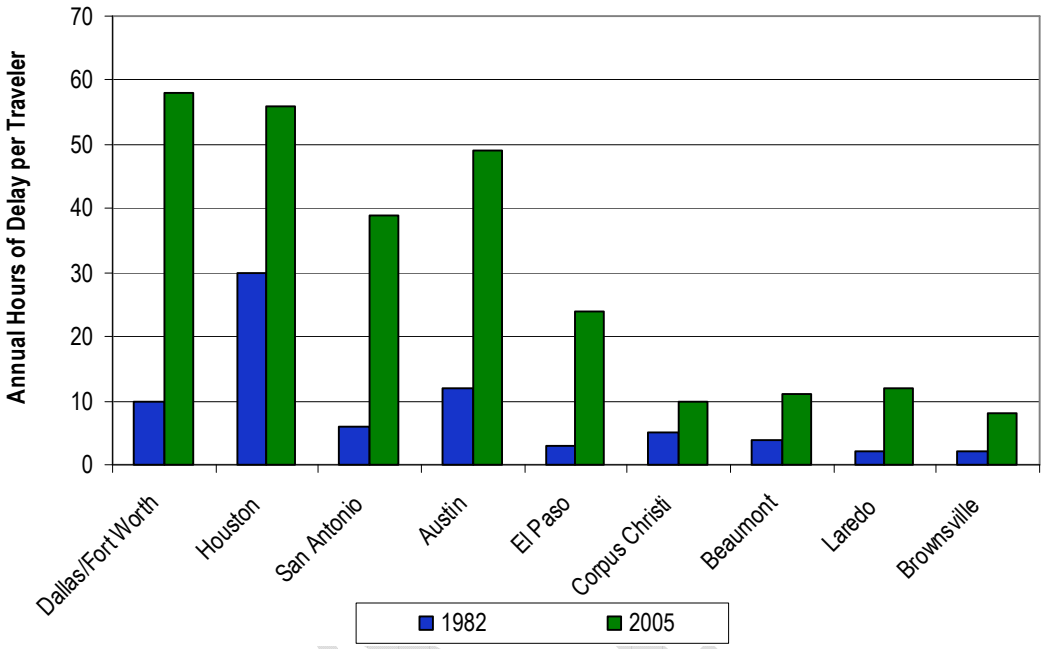
As growth in VMT continues to outpace growth in lane miles and highway demand increases faster than highway capacity improvements, congestion has continued to worsen in the state's largest metropolitan areas. The 2007 *Urban Mobility Report* showed congestion in nine Texas cities (Dallas/Fort Worth, Houston, San Antonio, Austin, El Paso, Corpus Christi, Beaumont, Laredo, and Brownsville) caused 342 million hours of delay and 243 million gallons of excess fuel consumption during 2005 (TTI 2007). Figure 3.7 shows the increase in annual hours of delay per traveler in Texas' most congested cities. Overall, travelers in these nine Texas cities experienced a 260 percent increase in annual hours of delay between 1982 and 2005.

Figure 3.6 Socioeconomic Trends Summary
2000 to 2005, and 2005 to 2030



Source: Texas State Data Center, Texas Comptroller of Public Accounts, TxDOT Pocket Facts, FHWA Highway Statistics, Cambridge Systematics

Figure 3.7 Annual Hours of Delay per Traveler
1982 vs. 2005



Source: Texas Transportation Institute, *The 2007 Urban Mobility Report*.

3.2 INDUSTRY DATA AND TRENDS

Goods-dependent industries accounted for 46 percent of the Texas GSP on average between 1990 and 2005 (compared to a service industry average of 54 percent), as shown in Table 3.2. By 2030, forecasts indicate that the service industry is expected to strengthen to about 56 percent of the GSP due to a decline in the goods-dependent mining industry and a sizeable increase in professional and business services (Texas Comptroller 2007).

Despite the slight increase in the importance of the service industry over the next 25 years, the goods-dependent industries are expected to continue to contribute significantly to the Texas GSP. The goods-dependent industries rely on the movement of goods to receive raw supplies and manufactured goods and to send their refined/finished product to market. As such, the goods-dependent industries contribute directly to freight volumes on Texas roadways.

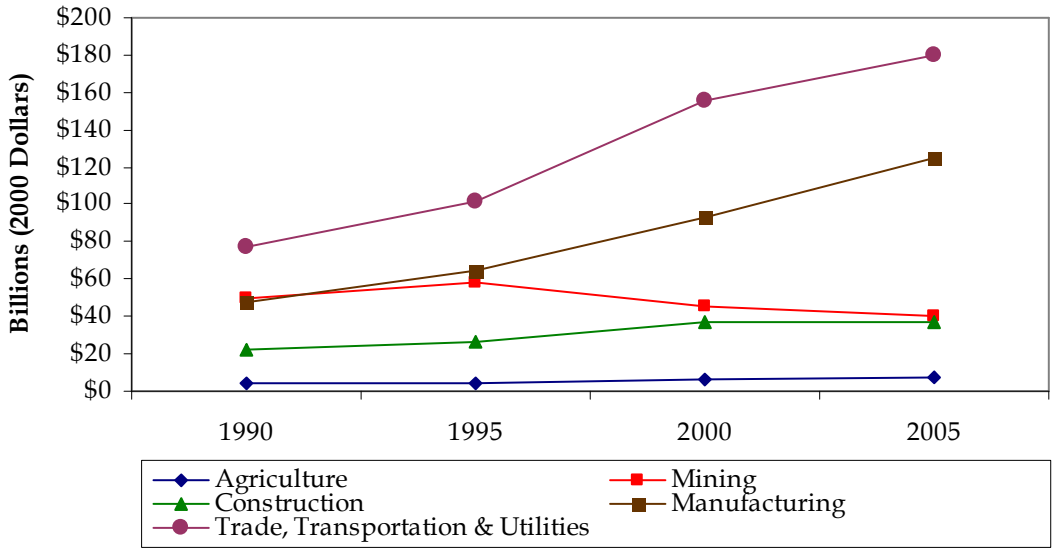
Table 3.2 Percent Contribution to Total Texas GSP by Industry
1990 to 2030

Industry Sector	1990	1995	2000	2005	2030
Goods-Dependent	**43.3%**	**45.9%**	**46.4%**	**46.8%**	**44.3%**
Agriculture	1.0%	0.8%	0.9%	0.9%	0.4%
Mining (Oil and Gas)	10.7%	10.5%	6.2%	4.8%	1.8%
Construction	4.9%	4.8%	5.1%	4.4%	4.3%
Manufacturing	10.2%	11.6%	12.8%	15.0%	19.7%
Trade/Transportation/Utilities	16.6%	18.3%	21.4%	21.6%	18.2%
Services	**56.7%**	**54.1%**	**53.6%**	**53.2%**	**55.7%**
Information	3.2%	3.8%	4.9%	5.3%	5.1%
Financial Activities	17.3%	16.0%	16.1%	15.1%	13.6%
Professional and Business Services	9.1%	8.9%	10.1%	11.3%	18.1%
Educational and Health Services	6.8%	6.4%	5.8%	6.3%	6.1%
Leisure and Hospitality	3.3%	3.2%	3.2%	3.0%	3.1%
Other Services	3.1%	2.9%	2.4%	2.0%	1.3%
Government	13.9%	12.8%	11.1%	10.2%	8.4%

Source: Texas Comptroller of Public Accounts Data, Fall 2007 Forecast.

Within the goods-dependent industries, the manufacturing sector and the trade/transportation/utilities sector have experienced dramatic growth over the last 15 years and have emerged as the two dominant goods-dependent industries in Texas (Figure 3.8). Combined, they contributed 78 percent of the goods-dependent industry GSP and 37 percent of the total Texas GSP in 2005. While the trade/transportation/utilities sector was the greatest contributor to GSP among the goods-dependent industries between 1990 and 2005, the forecasts prepared by the Texas Comptroller indicate the manufacturing sector is expected to increase 165 percent by 2030. By 2030, the manufacturing sector is expected to contribute the highest economic output to state GSP. The 2030 forecasts indicate that the agriculture and mining sectors will experience a decline from their 2005 GSP contributions (12 percent combined in 1990 to slightly over two percent by 2030).

Figure 3.8 Fifteen-Year Trend of Goods-Dependent Contributions to GSP
1990 to 2005 (2000 Dollars)



Source: Texas Comptroller of Public Accounts Data, Fall 2007 Forecast.

Transportation Impact

All of the goods-dependent industries are heavily dependent on trucks, while some of the industries also utilize rail, marine, and air modes. The agriculture, mining, manufacturing, and trade/transportation/utilities sectors each depend on rail and marine transport to some extent. Air transportation is typically reserved for light but high-value goods, such as those produced by high-technology manufacturing industries. As the manufacturing and trade/transportation/utilities sectors continue to grow, there will be an increased demand for truck, rail, marine, and air accommodations.

Freight traveling to or through the state contributes to demand on the Texas transportation system. Since the implementation of the North American Free Trade Agreement (NAFTA) in 1994, trade between the United States, Mexico, and Canada has grown significantly. The Texas highway system is the single most important infrastructure link between the economies of the United States and Mexico. In 2006, 68 percent of trucks and 91 percent of rail containers entering the U.S. from Mexico crossed the border at Texas points of entry (BTS 2006). Laredo served as the busiest point of entry for inbound trucks and trains from Mexico, processing more than 1.52 million trucks and 330,000 rail containers in 2006 (BTS 2006). As reported in the *Texas NAFTA Study Update* (2007), NAFTA tonnage on Texas highways and railroads is forecasted to increase by nearly 207 percent through 2030, resulting in significant impacts on the Texas highway and rail systems (CS 2007). Forecasts indicate truck tonnage will grow by 251 percent by 2030 and the number of trucks carrying NAFTA

goods is expected to increase by 263 percent. NAFTA truck VMT is expected to grow by more than 330 percent by 2030. The NAFTA percentage of total statewide truck VMT is projected to grow from nine percent in 2003 to 22 percent of all truck VMT in 2030.

Truck Freight

Trucking is the primary mode for moving freight to, from, and within the state. As shown in Table 3.3, trucks moved almost 46 percent of all freight by weight (totaling 985 million tons) and 66 percent by value (totally $866 billion) in 2002. The FHWA's Freight Analysis Framework (FAF) forecasts indicate that the role of trucking in Texas will increase in the future. By 2030, trucks are expected carry almost 51 percent of freight by weight and 69 percent of freight by value.

Rail Freight

Over 40 freight railroads traverse Texas and comprise the extensive freight rail network that provides connectivity to the state's seaports and international gateways. In 2002, rail moved almost 13 percent of freight by weight (225 million tons) and five percent of freight by value ($66 billion) to, from, and within Texas (Table 3.3). Forecasts indicate rail tonnage is expected to increase 102 percent and the number of rail units carrying NAFTA goods is expected to grow by 195 percent by 2030. Forecasts also indicate that the percentage of shipments moved by rail in terms of value will decline from their current rate to 2.8 percent by 2030.

Marine Freight

Marine transportation plays a less significant role than truck and rail for moving freight. Marine transportation served almost five percent of total shipments by weight and almost two percent by value for shipments to, from, and within Texas in 2002 (Table 3.3). The percentage of freight moved by water is expected to decline by 2030, representing four percent of freight by weight and less than one percent by value. However, the 28 seaports in Texas moved about 20 percent of the total U.S. tonnage of freight moved by waterway or seaport in 2005. Four of Texas' seaports, Houston, Beaumont, Corpus Christi and Texas City, ranked among the top 10 U.S. ports in terms of total tonnage in 2005 (U.S. DOT 2008).

Air Freight

Air transportation is typically used to transport high-value, time-sensitive goods. The FAF data shown in Table 3.3 shows that air cargo accounted for a negligible percentage of freight moved by weight, but 1.6 percent of freight by value in 2002. By 2030, the role of air transportation is expected to increase to 2.1 percent of freight by value. For intrastate travel, trucks are able to compete with air transportation for providing time-definite services. Similarly, air transport relies on trucks to facilitate the transfer of cargo from the airport to/from its destination/origin.

Table 3.3 Freight Movement To, From, and Within Texas by Weight and Value

2002 and 2030

	2002				2030			
	Within State	From State	To State	% of Total	Within State	From State	To State	% of Total
Shipments by Weight (in Million of Tons)								
Truck	696.2	138.3	150.8	45.5%	1,363.7	312.3	309.9	50.8%
Rail	95.1	51.2	124.4	12.5%	173.2	78.2	230.3	12.3%
Water	54.9	22.3	28.8	4.9%	80.9	35.1	41.3	4.0%
Air, Air & Truck	0.1	0.1	0.1	0.0%	0.1	0.4	0.3	0.0%
Truck & Rail	0.8	1.7	3.3	0.3%	0.7	2.0	7.5	0.3%
Other Intermodal	7.6	1.5	3.5	0.6%	13.7	6.1	6.8	0.7%
Pipeline & Unknown	443.0	149.8	191.6	36.2%	737.9	227.8	278.2	31.8%
Total	**1,297.6**	**365.0**	**502.5**		**2,370.7**	**661.9**	**874.4**	
Shipments by Value (in Billion of Dollars)								
Truck	$389.71	$206.50	$270.27	66.4%	$1,065.9	$848.63	$700.49	69.2%
Rail	$11.72	$29.56	$24.43	5.0%	$16.74	$40.33	$47.84	2.8%
Water	$12.97	$5.08	$7.14	1.9%	$16.44	$8.36	$10.55	0.9%
Air, Air & Truck	$0.62	$10.81	$8.90	1.6%	$2.88	$56.45	$21.44	2.1%
Truck & Rail	$0.05	$0.97	$6.44	0.6%	$0.09	$1.42	$17.13	0.5%
Other Intermodal	$15.77	$46.87	$44.83	8.2%	$62.15	$292.06	$199.47	14.7%
Pipeline & Unknown	$99.10	$46.28	$67.02	16.3%	$176.92	$92.06	$101.60	9.8%
Total	**$529.93**	**$346.07**	**$429.03**		**$1,341.12**	**$1,339.31**	**$1,098.52**	

Source: Federal Highway Administration, Freight Analysis Framework 2.2 adjusted from 2035 to 2030 using an average annual growth factor.

4.0 Statewide Mobility and Maintenance Needs Assessment

The socioeconomic and industry trends described in Section 3.0 will place additional demands on the state's transportation system. Existing infrastructure will need to be maintained, new system capacity may be needed in some locations, and the development and maintenance of intermodal connections will continue to be important. These issues will require appropriate multimodal transportation planning, as well as investment in capital and maintenance activities. The following sections describe capital and maintenance investment needs across all transportation modes in the state.

4.1 NEEDS SUMMARY

To develop a better understanding of the state's needs, CS conducted a needs assessment by mode to estimate the investment required to meet the growing demands on the state's transportation system over the next 25 years. The needs summarized in Table 4.1 represent the average annual investments (2005 to 2030) required to improve statewide mobility by 2030. These needs figures are presented in 2003 dollars (i.e., they do not account for inflation). They represent transportation investments that have tangible mobility benefits to the state.

Needs are traditionally identified by mode and the following sections provide mode-by-mode summaries of transportation investment needs. However, it is important to keep in mind the multimodal tradeoffs that are increasingly influencing the investment activities of states and MPOs. Considering needs on a multimodal basis helps encourage the most efficient use of the transportation system and recognizes the ways in which individual modes work together within the system to improve mobility. For example, targeted investments in public transportation systems may effectively meet some of the highway needs. Similarly, multimodal corridor or system-level improvements that combine capital and operations investments can provide solutions in many areas. It is critical to keep these multimodal tradeoffs in mind when evaluating investments across modes.

Table 4.1 Total Statewide Multimodal Transportation Needs for 2005 to 2030
(in Millions of 2003 Dollars)

Mode	Average Annual Needs Estimate (2005-2030) ($ Millions)
Highways and Local Roads (Capital and Maintenance)	$15,928
Public Transportation (Capital)	$1,183
Freight Rail and Intermodal Freight (Capital)	$637
Marine (Capital)	$255
Aviation (Capital)	
Commercial	$893
Noncommercial	$158
Bicycle and Pedestrian (Capital)	$29

Source: Cambridge Systematics, Inc. Estimates of all needs were made in 2000 dollars and adjusted to 2003 dollars by applying Consumer Price Index inflation factors.

4.2 HIGHWAY NEEDS

CS estimates the total highway needs (and local roads) in Texas to be $414 billion through 2030 (in 2003 dollars). This needs estimate includes the funding required to construct new infrastructure and maintain existing infrastructure. The capital needs total $12.5 billion per year, of which $10.1 billion is estimated for TxDOT capital needs, and $2.4 billion for infrastructure maintained by other entities. Table 4.2 shows the breakdown of the state's 26-year highway needs. It is important to note that these needs are not financially constrained and provide an indication of the magnitude of the potential investment required for the Texas highway network.

CS based the highway needs analysis[2] on TxDOT's 1997 Highway Needs Assessment and on the Highway Economic Requirements System (HERS) model,

[2] An explanatory word about maintenance needs: the maintenance estimate from the HERS model is based on TxDOT expenditure data, and is not a condition-based maintenance estimate. If TxDOT were to conduct a maintenance needs assessment, the work would not only be based on average annual maintenance expenditures, but on asset management-based determinations of condition, age, preventative maintenance cycles and replacement estimates for the pavements and bridges in TxDOT's 78,000 mile state highway system. In addition, the HERS model's capital needs estimate includes all projects that would qualify for capital program funding at the federal level. Thus, the capital needs in Table 4.2 includes many types of reconstruction or

Footnote continued

a commonly used tool for state and national highway needs analysis. If the needs were met:

- The total hours of delay on Texas highways would decline substantially;
- Total user costs (which include travel time costs, vehicle operating costs, and accident costs) would be much lower per mile of travel; and
- Pavement and bridge conditions would improve.

Table 4.2 Average Annual Total Texas Highway and Local Road Needs, 2005 to 2030
(in Millions of 2003 Dollars)

Highway Needs Category	TxDOT's Highways and Local Roads	Other Agencies' Highways and Local Roads	Total for All Highways and Local Roads
Capital	$10,052	$2,409	$12,461
Maintenance	1,376	2,091	3,467
Total for All Highway and Local Road Needs	**$11,428**	**$4,500**	**$15,928**

Source: Cambridge Systematics, Inc. and previous TxDOT Needs Assessments.

Note: These needs are not fiscally constrained and do not represent estimated expenditures. The maintenance estimate is based on routine/preventative maintenance expenditures listed for the 'optimal needs' scenario in TxDOT's 1997 Transportation Needs Revenue Assessment, adjusted for inflation. "Highways" is not a functional classification; in this table, the word refers to all controlled-access highways, roads, and streets. "Other agencies" refer to all other public-sector owners of roads and streets.

4.3 PUBLIC TRANSPORTATION NEEDS

There are seven Metropolitan Transit Authorities (MTAs) contained within Texas' major cities (El Paso, Austin, Dallas, Fort Worth, Houston, San Antonio, and Corpus Christi). These agencies provided 91 percent of the total unlinked transit trips in the state in 2002 (about 252 million trips). In addition to the MTAs, there are 32 urbanized area transit systems in Texas, 40 non-urbanized area transit systems, and more than 300 transit providers serving populations with special needs such as the elderly and disabled. Table 4.3 shows that transit use is expected to grow significantly in Texas by 2030, with overall transit demand growing by 117 percent.

rehabilitation projects that TxDOT considers as maintenance projects (TxDOT includes these kinds of projects, eligible for federal reimbursement, as contracted maintenance) in its programming and financial reporting.

Table 4.3 Current Transit Demand and Forecasts by Type of Area in Texas

Passenger Trips (Millions)	2000	Forecast 2030	Forecast Percent Growth
MTAs (largest urban areas)	263.784	563.804	114%
Urbanized (other urban areas)	15.812	41.806	164
Non-urbanized	4.448	9.414	112
All Transit Systems	**284.044**	**615.024**	**117%**

Source: Forecasts are from Cambridge Systematics, Inc. Projections for elderly and disabled transportation providers are not available; ridership for these systems in 2000 was 3.816 million. If the growth rate (116 percent as estimated as a total for all Texas transit systems) continues through 2030, the expected total elderly and disabled ridership will be 8.242 million.

CS estimates the total capital needs for all public transportation systems in the state at $30.8 billions over 26 years, or about $1.18 billion annually between 2005 and 2030. We developed these needs from the long-range plans of the MPOs of the larger urban areas, and from a CS model of long-range bus-transit capital needs used at the national level for reports to the U.S. Congress. Needs for MTAs total $27.96 billion, or about $1,075 million per year. Urbanized area transit systems will require about $993 million in capital investment over the 26-year period. Due to expanding population, service areas, and customer bases, non-urbanized area transit systems will require more than $902 million in capital investment between 2005 and 2030. This also requires an annual funding level of more than $38 million. Funding requirements for elderly and disabled transit providers on a statewide basis total more than $804 million over the 2005 to 2030 period and require an average annual funding level of $30.9 million.

Table 4.4 Average Annual Total Texas Public Transportation Capital Needs for 2005 to 2030

(in Millions of 2003 Dollars)

Type of System	Average Annual Capital Needs ($ Millions)
MTAs	$1,075.5
Urbanized Areas	38.2
Non-Urbanized Areas	38.6
Elderly and Disabled	30.9
All Systems	**$1,183.2**

Source: Cambridge Systematics, Inc.

4.4 FREIGHT RAIL AND INTERMODAL FREIGHT NEEDS

Table 4.5 summarizes the rail freight capital needs and the estimated annual costs for railroads in Texas. CS extrapolated freight rail needs estimates from national studies as a Texas percentage of national needs. These needs represent average annual needs.

Table 4.5 Average Annual Texas Rail Freight and Intermodal Freight Capital Needs
(in Millions of 2003 Dollars)

Freight Rail Needs by Category	Estimated Average Annual Investment in Texas ($ Millions)
Short-Line Infrastructure	$27
Class I – Infrastructure	396
Class I – Non-Infrastructure	159
Safety	55
Total	**$637**

Source: Cambridge Systematics, Inc.

Note: All annual averages for Texas rail needs, rounded to millions, are based on approximate Texas percentages of estimated national needs. Non-Infrastructure rail needs include operational issues for border crossing efficiency and technological advancements such as electronic braking, remote control of trains, asset optimization, and dispatching.

4.5 MARINE TRANSPORT NEEDS

Table 4.6 shows transportation system needs identified by the ports or other sources (in 2003 dollars). Texas ports will require approximately $255 million per year for capital investment and $34 million per year for maintenance. In total, marine transport will need an estimated $7.5 billion investment between 2005 and 2030.

Table 4.6 Average Annual Total Texas Marine Capital Needs for 2005 to 2030
(in Millions of 2003 Dollars)

Marine Investment Needs by Primary Use	Total Cost (Millions $)
Waterside (Capital)	
New Dredging	$334
Bridge Clearance	184
Port Facilities (Capital)	6,120
Total Capital	**$6,638**
Waterside (Maintenance)	
Maintenance Dredging	$423
General (Maintenance)	
Environmental	111
Security	356
Total Maintenance	**$890**
Marine Total	**$7,528**
Marine Average Annual	**$290**

Source: Cambridge Systematics, Inc.

4.6 AVIATION NEEDS

Table 4.7 shows the estimated capital needs through 2030 for the state's commercial airports. Of the nearly $23.2 billion in projected needs, obtained from various commercial airports' master plans and extrapolated to 2030, about $17.2 billion is targeted for just Dallas-Fort Worth International Airport and the Houston airport system. Other airports with large shares of the remaining needs include those serving Austin, San Antonio, and El Paso. The average annual total commercial airport needs requirement over the 2005 to 2030 period is $893 million per year.

Table 4.7 Average Annual Total Texas Commercial Aviation Capital Needs for 2005 to 2030

(in Millions of 2003 Dollars)

Metropolitan Commercial Airport	Average Annual Needs	Total Estimated Capital Needs Through 2030 (in Millions)
Dallas-Fort Worth International	$351.40	$9,136.41
George Bush Intercontinental	227.70	5,920.10
William P Hobby	83.89	2,181.09
Austin-Bergstrom International	97.38	2,531.99
Dallas Love Field	7.88	204.86
San Antonio International	28.63	744.46
El Paso International	7.30	189.72
Lubbock International	4.05	105.27
Midland International	2.78	72.33
Rio Grande Valley International	2.84	73.83
Total: Smaller Commercial Airports*	**$79.19**	**$2,059.02**
Total: All Commercial Airports	**$893.02**	**$23,218.57**

Source: Cambridge Systematics, Inc.

Note: Capital and incremental needs may not add exactly to totals due to rounding.

*Texas smaller commercial airports (in order of annual passenger boardings): Amarillo International, Corpus Christi International, McAllen-Miller International, Killeen Municipal, Easterwood Field, East Texas Regional, Laredo International, Tyler Pounds Field, Brownsville/South Padre Island, Waco Regional, Abilene Regional, Sheppard AFB/Wichita Falls, San Angelo Regional/Mathis, Ellington Field, Victoria Regional, Texarkana Regional, and Southeast Texas Regional.

Table 4.8 shows the estimated non-commercial airport capital needs for Texas between 2005 and 2030, in millions of dollars. All costs shown are in constant 2003 dollars. Needs are based on the Texas Airport System Plan (TASP) analysis of needs. Average annual needs for the noncommercial airports total approximately $157.5 million per year. Therefore, total aviation capital needs through 2030 are $27.3 billion and, on an annual basis, $1.05 billion per year ($893 million for commercial and $157 million for noncommercial).

Table 4.8 Average Annual Total Texas Noncommercial Aviation Capital Needs for 2005 to 2030
(in Millions of 2003 Dollars)

Airport Role	Average Annual Needs	26-Year Needs
Reliever	$63.3	$1,647
Transport	31.7	823
General Utility	47.7	1,241
Basic Utility	14.8	384
Total	**$157.5**	**$4,095**

Source: Cambridge Systematics, Inc., based on the 2002 Texas Airport System Plan.

4.7 BICYCLE AND PEDESTRIAN NEEDS

The estimates for bicycle and pedestrian needs include the cost of constructing bikeways (many of which serve pedestrians as well) and pedestrian improvement projects. CS estimates the total bicycle and pedestrian construction needs at $766 million, of which $604 million is needed to complete the 2,596 miles of planned bikeways and $161 million is estimated for projects that would primarily serve pedestrians. This is an average annual total expenditure of $29.4 million per year for bicycle and pedestrian facilities combined.

It is important to note that these bikeway and pedestrian needs may expand significantly in the future, because not all areas have yet developed their plans for bicycle and pedestrian improvements. Bicycle planning is a relatively recent addition to the transportation planning process. While not all metropolitan areas have quantified the needs of these alternative modes, many cities are actively planning and implementing bicycle and pedestrian programs within their jurisdictions. For example, the City of Lubbock has had an active bicycle planning program since 1994, and a transportation enhancement grant was used to develop over 60 miles of bike routes in the city (Lubbock MPO 2006).

5.0 Texas Business and Community Leader Interviews

To supplement the literature review findings and the data trends analysis, and to provide additional context and commentary for the study CS conducted a series of targeted interviews with business and community leaders across the state. This section presents the interview approach and summarizes the interview findings.

5.1 Interview Approach

CS, in collaboration with TxDOT GPA staff, developed a targeted list of interview participants representing a diverse mix of geographical, business, and community interests within the state. Interview participants included representatives from:

- Several chambers of commerce across the state;
- Economic development and transportation planning organizations; and
- A variety of industries, including manufacturing, distributing, shipping, land development, medical services, and transportation.

We prepared two sets of interview questions to solicit the perspectives from the different categories of interview participants. We directed the first interview questionnaire toward chambers of commerce, planning agencies, and economic development organizations to gain a greater understanding of regional transportation needs and understand the relationship between transportation mobility and economic vitality within the region. We targeted a second set of interview questions toward businesses and industries to understand how transportation mobility affects business location decisions, financial profitability, and competitive edge. Both interview questionnaires, included in Appendix A, focused on several key topics:

- Why should Texans care about transportation issues?
- What impact does mobility have on the state's economic vitality and quality of life?
- What are the consequences of failing to meet the state's transportation mobility and maintenance needs?
- What are the perceived transportation system needs that are currently not being met and/or funded?

We encouraged participants to offer their opinions on existing system conditions, adequacy of available transportation funding, and future consequences if transportation needs are not addressed. The following sections provide interview summaries and quotes from interview participants.

5.2 Mobility Impacts on Economic Vitality and Quality of Life

The surveyed participants identified a multitude of impacts that transportation mobility has on economic vitality and quality of life in their regions and in Texas. The interview participants offered differing perspectives regarding how their specific businesses or regions are impacted. However nearly all interviewees agreed that that transportation mobility has a direct impact on economic competitiveness and vitality, particularly business and industry operations. Similar to many respondents, the President of one Texas Chamber of Commerce expressed this concern:

> *Quite simply, delay caused by congestion affects the movement of goods, employees, and customers. Our city is nearing a crossroads where if it does not receive funding to accommodate the transportation needs resulting from near-term growth, mobility levels will rapidly decline. The city and state need to proactively recognize and address these needs to maintain economic competitiveness (May 2008).*

In many industries, transportation mobility directly affects the bottom line of Texas businesses. The interview participants correlated transportation mobility to the following:

- **Reliability –** Mobility affects the ability of employees to get to work on time or shippers and distributors to get their goods to their destinations on time. An increased level of uncertainty in travel times due to mobility constraints affects the ability of businesses to meet service levels and client expectations. Reduced transportation reliability requires businesses to pay penalties for late shipments or to make costly adjustments to accommodate slower average delivery times.
- **Operational Efficiency –** Congestion causes longer travel times that may require a shipper to increase redundancy or the number of delivery routes, thereby reducing operational efficiency. It may also require a business to reduce reliance on just-in-time deliveries, affecting inventory volume and space requirements. Mobility constraints also may impact a business' ability to accommodate seasonal location adjustments for employees, such as appropriately distributing hospital staff among area hospitals during flu season or large-scale emergencies.
- **Operating Costs –** Costs for fuel, driver/employee time, and equipment maintenance increase as mobility and infrastructure maintenance levels decline. Rising fuel costs continue to be a big concern and a big operating

cost for Texas businesses. As corporate account executive for a full service logistics provider stated:

> *Today fuel is our number one cost. Congestion further exacerbates the rising cost of fuel as our vehicles burn fuel while idling in traffic. As fuel costs increase, we have to raise our rates or offer reduced service level targets to maintain our profit margin. Our profitability suffers, we provide a slower service at a higher cost, and eventually the entire regional economy is impacted (April 2008).*

- **Regulations –** Higher vehicle emissions reduce air quality. Businesses are subject to tougher, more costly regulations as increasing congestion elevates more areas to non-attainment status, where air pollution levels persistently exceed national ambient air quality standards.
- **Business Attraction –** The condition of a region's transportation system affects the region's ability to attract new businesses and labor pools to the area. It specifically impacts the region's ability to recruit and retain talent, attract new businesses to an area, expand business operations, and increase productivity.

These operating characteristics affect the ability of businesses and industries to make a profit. Business productivity and competitiveness, in turn, affects economic growth within the state.

In addition to affecting the business operations of companies currently operating in Texas, the condition of a region's transportation system affects the region's quality of life and the ability to attract new businesses and citizens to the area, as indicated by a Chamber of Commerce senior vice president:

> *CEOs of both major and small companies cite traffic congestion as a huge concern, if not their primary concern, in attracting and retaining talented workers. Mobility constraints affect the quality of life for employees by influencing the amount of time people can spend with their families. As costs of living rise and quality of life declines, our urban community will become a less attractive place to live and work (April 2008).*

Interview participants identified several community quality of life issues tied to mobility constraints:

- **Congestion –** When the transportation system operates smoothly and without delay, people move seamlessly from origin to destination. However, when congestion impairs the ability of people to get to and from their desired destinations, daily commuting costs will increase due to excess fuel usage and time delay. Drivers are more prone to elevated levels of stress, frustration, and irritation when driving in highly congested conditions. Studies have linked prolonged or repeated exposure to stressful situations with heightened driver aggression.
- **Air Quality -** Vehicles delayed in congested conditions burn excess fuel, increasing emissions and contributing to air quality concerns.
- **Community Livability –** Longer daily commutes affect the amount of time people are able to spend with their families, participate in recreational

activities, and become involved in community issues. Mobility can also affect housing costs and may initiate urban lifestyle changes. Communities that suffer from reduced mobility may become less attractive over time, as people choose to live and work elsewhere to avoid high housing and commuting costs.

Mobility limitations affect the region's ability to recruit and retain talented workers, attract new businesses or industries, or encourage business expansion. As such, quality of life directly relates to business growth and long-term sustainability, which ultimately affect the state's economic vitality.

5.3 Consequences of Failing to Meet Texas' Transportation Needs

Failure to address transportation needs may result in making Texas a more difficult place to attract innovative industries, businesses, and citizens that have been critical to the state's economic growth over the last several decades. As one MPO Director stated:

> *Transportation is our future. We cannot let the system reach gridlock and expect our economy to remain strong. We need a strong voice to communicate our problems and brainstorm solutions that can enable us to catch up with demand and invest in transportation infrastructure to sustain our growth (May 2008).*

Other interview participants cited several specific consequences that the state could reasonably expect if mobility and maintenance levels fail to keep pace with Texas' growing transportation demand. These include:

- **Rise in cost and shifts in availability of goods** – As the costs to transport goods continue to increase due to mobility limitations, these additional costs will be passed on to shippers and, ultimately, to consumers. Likewise, distributors may no longer be able to afford to bring certain goods (such as fresh bread, produce, and dairy) to market as expeditiously or with the same frequency as current levels. A supply chain and logistics professional for a grocery distributor provided this example:

  > *Currently, the bread we distribute to our stores is baked overnight and delivered fresh to our stores in the morning via special truck shipments. As daytime congestion worsens, however, we may have to start including the bread deliveries with our regular nighttime food shipments and the bread will already be a day old when arriving to the store…One consequence of declining mobility levels will be more age on the products available for purchase in our stores (April 2008).*

  Reduced business attractiveness – Mobility constraints reduce the state's competitive edge for attracting businesses. Industries relying on transportation, such as manufacturing, will choose to locate in areas with fewer transportation-related concerns. If mobility conditions get bad enough, families and businesses may choose to move out of the state in search of a better quality of life or less expensive operating conditions. Chambers of Commerce across the state are increasingly recognizing this trend:

If mobility levels continue to decline from their current condition, we may not notice the economic impact immediately. Over the long-term, however, people and businesses may choose to move away from the city as they get increasingly fed up with the problem (Chamber of Commerce Vice President, May 2007).

Using California as an example, the recent rise in cheese and dairy factories in the Texas Panhandle has been due, in part, to companies relocating from California. Similarly, many industries rely on the presence of other industries for their business. For example, logistics and shipping companies will locate where manufacturing companies operate. If manufacturers decide to relocate due to inefficiency in receiving shipments from suppliers, the region will lose more than just the manufacturing business. The logistics and shipping industries will also leave to follow their customer base.

- **Incremental solution cost increases –** Delayed action in investing in our transportation system means the incremental costs of future transportation solutions will continue to rise. The cost of the materials and right-of-way needed to build new infrastructure will continue to grow over time. Similarly, the cost and complexity of transportation solutions will increase as the breadth of the problem increases. As primary roads (e.g., principal arterials, state-owned highways and freeways) become more congested, more traffic will start utilizing the lower class roadways and city-maintained minor arterials. As minor arterials become more congested, traffic will redistribute to city-maintained collector roads and local streets. Ultimately, the entire transportation network will approach gridlock as traffic volumes continue to grow and problems spread through the system. One manufacturing company manager cautioned:

  While locating one's business on the edge of a growing city can protect them from urban congestion in the short term, ultimately growth and congestion will expand outward as transportation demand exceeds supply. Rather than ignoring the problem, coordinated and proactive transportation planning and economic development initiatives should be undertaken concurrently at state, city, and local levels to prepare for and sustain the economic growth the city is blessed to have (May 2008).

  The congestion problem trickles down through all levels of the transportation network requiring action and coordinated solutions at state, city, and local levels.

5.4 TRANSPORTATION SYSTEM AND FUNDING NEEDS

Transportation System Needs

From the perspective of the interview participants – who represent many of the users of the state's transportation system – existing traffic volumes and transportation demand for all modes have overwhelmed the existing system; and the transportation system will continue to be overwhelmed as trade, goods movement, and population continues to grow.

The interview participants stressed that the existing transportation network is struggling to serve the reliability and efficiency needs of Texas' communities and businesses. Moreover, much of the existing highway system is nearing the end of its design life. One Chamber of Commerce interviewee summarized the state's transportation needs as follows:

> *All of the transportation modes in our state require more investment. The Interstate system is 50 years old and the Farm-to-Market network is 40 to 60 years old and both are in need of expansion and rehabilitation. Our cities need more transit investment for buses, light-rail, and commuter rail. We should also invest in high-speed rail to compete with statewide regional air service (April 2008).*

As economic forecasts indicate that the Texas population and economy will continue to grow over the next 25 years, Texas needs to plan for the direct and indirect effects of such growth on the state's infrastructure and transportation resources. To meet these needs, the interview participants identified several transportation improvement opportunities:

- **Improve Intermodal Capabilities in Smaller Cities –**Intermodal capabilities currently exist in Texas' largest cities (Dallas/Fort Worth, Houston, and San Antonio), but enhanced intermodal connectivity in smaller cities such as Austin and Amarillo would provide offloading and transshipment capabilities at more destinations and limit the number of circuitous or duplicated truck and rail shipments through the state. Limited existing intermodal capabilities require that many freight shipments travel farther or less efficiently. One interview participant cited the following example:

  > *The components for a playground equipment manufacturer located in Amarillo pass through the region by train en route to Dallas for offloading. From Dallas, the same components are loaded onto trucks and driven over 400 miles back to the manufacturer in Amarillo (April 2008).*

  Similarly, an Austin logistics provider utilizes rail to move containers from the Ports of Los Angeles and Long Beach to San Antonio. Because the freight's final destination is Austin, the lack of rail-truck offloading capabilities in Austin requires increased time and cost to truck the shipments from San Antonio to their final destination in Austin. Both of these examples illustrate the need for enhancing intermodal capabilities to improve system efficiencies and reduce transport costs.

- **Provide More Transportation Alternatives –** The lack of viable transportation alternatives to the personal automobile exacerbates congestion and mobility problems in many Texas cities. Transit investment would improve workers' ability to commute to work and/or cut down on daily travel costs. Similarly, improved passenger rail service would facilitate intercity travel within the state. Efficient public transportation networks can reduce costs associated with driving and automobile ownership.

- **Improve Highway Capacity –** Highway capacity expansions were the most commonly desired transportation improvement among interview

participants. Additional capacity within the state is needed to accommodate north/south movements (serving NAFTA goods movements), particularly along Interstate 35. However, the interview participants indicated that highway improvements would best enhance overall system efficiency when combined with rail, aviation, and transit improvements as well.

Funding Transportation Needs

The overwhelming response from interview participants indicated that transportation investment in Texas is not keeping up with rising demand. The list and cost of needed transportation projects continues to increase, while the available funding for project programming remains stagnant. Texas is struggling to maintain existing infrastructure with available transportation funding, much less fund and maintain new projects as noted by this MPO Director:

> *When it comes to transportation funding, we currently have a crisis on our hands. Available transportation funding is straining to keep up with maintenance requirements, much less capacity improvement needs. Our region is continuously looking for additional funding sources that can be applied to transportation projects (May 2008).*

The interview participants indicated that we are not lacking in the number of financing mechanisms available to fund transportation projects. A fair number of traditional and innovative financing techniques are available for such use. However, several participants indicated that the current *usage* of these existing funding options has been inadequate, as echoed by this sentiment:

> *We need to identify new revenue sources and we need to use all financing resources available to us. We need to fund projects that will leverage the highest return on our investment and use those returns to fund additional projects (Senior Vice President of a master developer in Texas, April 2008).*

Traditional transportation funding is simply no longer sufficient to meet the state's transportation needs. Texas needs to utilize all available financing mechanisms and resources available, and develop an innovative approach to funding transportation projects. Potential funding sources cited by the interview participants include the following:

- Federal, state, and local taxes, including gas taxes imposed by all government levels, statewide income tax, and local sales tax;
- Fees or tolls collected through leases, licenses, gross-vehicle weight, VMT, or tolled facility usage;
- Public-private partnerships or private investment;
- Loans, grants, or reimbursements from the Federal government; and
- Realignment of other existing state funds (general fund).

Reprioritizing and investing in transportation projects that have the potential to leverage the highest returns will generate revenue to re-invest into additional transportation projects. Similarly, many respondents specified the need to leverage private investment in transportation. The Senior Vice President of a major healthcare provider offered these sentiments:

> *It is unrealistic to think that we will have a lot more money in the future to use toward transportation investment. Increased privatization and public-private partnerships may provide the best possibility to build needed roads in a reasonable time frame and at a reasonable price (May 2008).*

While the interview participants expressed concern about the magnitude of the state's transportation needs and the economic consequences of failing to meet growing demands, many respondents remain optimistic that Texas decision-makers will find a way to make it work. As the president of an economic development corporation stated:

> *If the state can solve its transportation funding problems, it stands to be a big winner in retaining and attracting business. Texas needs innovation to identify and implement additional funding mechanisms that can succeed in meeting the state's growing transportation demand (April 2008).*

Interview participants were encouraged by the state's continued lead in proactively evaluating Texas transportation needs and developing innovative funding solutions to address them.

6.0 Summary and Conclusion

Over the next 25 years, the Texas population will grow by 41 percent to 31.8 million by 2030. The economy will grow even faster during the same period, at an annual rate of 2.9 percent, with total GSP reaching nearly $1.7 trillion by 2030. Because of this population and economic growth, the demand for passenger and freight transportation is expected to increase accordingly in coming decades. Forecasts indicate that VMT will experience a 70 percent increase by 2030, with Texas roadways accommodating 368 billion VMT annually.

In the context of this rising demand for transportation, the Texas transportation system will require substantial investment to maintain existing infrastructure and fund additional capacity. CS estimates that an investment of $15.9 billion for highway needs, $1.2 billion for public transportation, $637 million for freight rail, $255 million for marine transportation, and $1.0 billion for commercial and noncommercial aviation would be required *each year* through 2030 to meet the state's multimodal transportation needs.

Addressing these substantial needs will be critically important to sustain the Texas economy and preserve a desirable quality of life. Transportation investment boosts industry competitiveness and productivity, creates jobs, and reduces economic losses due to time delays and excess fuel consumption, while strengthening local, regional, and state economies.

Developing comprehensive mobility and maintenance solutions to meet the state's transportation needs requires timely action by state legislators, informed by participation from regional, city, and local leaders. To promote and sustain its future economic vitality, Texas must plan for ways to expand its multimodal transportation network to handle the expected growth in population and international trade.

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Appendix A. Interview Guide

TxDOT GPA Division has tasked CS with developing a comprehensive description of the current and future needs of the Texas transportation system, both in terms of mobility and maintenance. Targeted interviews with business and community leaders across the state will provide the context and commentary necessary to help policy-makers understand the importance of transportation investment as they strategize solutions to address the future challenges of state.

Background

During the interview process, CS will solicit perspectives from Texas business and community leaders on how transportation mobility affects the Texas economy. The selected participants will represent a mix of geographical and business interests within the state. The interview findings will provide additional context to qualitatively describe the need for transportation investment in Texas.

The interviews will focus on several key topics:

- Why should Texans care about transportation issues?
- What impact does mobility have on the state's economic vitality and quality of life?
- What are the consequences of failing to meet the state's transportation maintenance and mobility needs?
- What are the perceived transportation system needs that are currently not being met and/or funded?

CS will conduct the majority of interviews by phone, with some being conducted in person, as appropriate.

Interview Questions

CS will contact each potential participant and describe the project goals using the pre-interview questions listed above under Background to obtain participation in the survey. Once we have obtained participation, CS will either schedule the full interview for a later, more convenient time or, if desirable from the participant's perspective, conduct the full interview as part of the initial phone conversation.

We have prepared two sets of questions for participants representing:

1. Chambers of commerce; and
2. Businesses or industries.

During the interview, we will ask each participant to offer their opinion on three key topic areas: existing system conditions, available transportation funding, and future consequences. Based on participants' initial responses to the questions, CS will shape and tailor follow-up questions as part of the interview to obtain more qualitative and detailed feedback. The questions/statements for the two types of participant are presented below. In some cases, we also provide anticipated follow-up questions to the initial questions/statements.

Chambers of Commerce Questions

- Under current conditions, does the regional transportation network meet the reliability, safety, efficiency, and intermodal needs of your members?

  If "NO"

  - Who and/or what modes are most negatively impacted and how?
  - In what ways do mobility constraints in your region affect the ability of your members to access labor pools and/or markets?
  - How do mobility constraints in your region negatively impact your region's ability to attract business to this area?
  - Are you aware of businesses and/or industries that have decided not to locate in Texas (or your region) due to transportation concerns? What types of concerns were cited? What types of industries are most affected?
  - How do traffic congestion and poorly maintained transportation infrastructure effect economic growth in your region?
  - Does the region have adequate connectivity to statewide, national, and global markets by air, sea, rail, and/or road? What connectivity is lacking? How does the lack of connectivity affect your ability to attract business to your area?

  If "YES"

  - What processes have been important in ensuring that the regional transportation needs are met?
  - Does the transportation network in your region give you a competitive advantage in attracting business to your area?
  - What impact does an efficient transportation system have on the economic vitality of your region?
  - What impact does an efficient transportation system have on the quality of life in your region?
  - How does the transportation system promote growth in your region?

- Do you believe transportation investment in Texas is keeping up with rising demand?

  - What locations and systems (routes) require more transportation investment?
  - What transportation modes need more investment and why?
  - Are there an adequate number of available financing mechanisms for transportation system investment in your region?
  - What types of funding mechanisms are available?
  - Are projects adequately funded?

- If mobility levels and transportation maintenance levels were to decline from their current condition, what impacts do you foresee?
  - Are you concerned that some of your members may leave the state if transportation needs are not addressed?
  - How will increasing delay in passenger and freight travel activity brought about by congested facilities threaten the economic vitality of Texas?
  - How will a decline in mobility levels and transportation maintenance degrade the quality of life in your region?

Industry Questions

- What modes are most critical to your business operations? Under current conditions, do these modes operate *reliably* to suit your needs? *Safely*? *Efficiently*?

  If "NO"

  - How does delay in passenger and freight travel activity brought about by congested road facilities affect your bottom line (fuel costs, cost of delay)?
  - How do existing mobility constraints affect your ability to access labor pools and/or markets?
  - In what ways do mobility constraints limit your ability to expand business operations in the region or the state?
  - Would improvements to nonhighway transportation modes (rail, aviation, and/or waterborne modes) allow you to expand your business operations in Texas?
  - Does the region have adequate connectivity to statewide, national, and global markets by air, sea, rail, and/or road? What connectivity is lacking? How does the lack of connectivity affect your ability to conduct business in your area?
  - How do transportation efficiency and reliability affect your business location decisions?

If "YES"

- How do transportation efficiency and reliability affect your business location decisions?
- Does your use of the transportation network in Texas give you an advantage over your competitors?
- How does regional mobility impact your ability to access labor pools and/or markets?

- Do you believe transportation investment in Texas is keeping up with rising demand?
  - What locations and systems (routes) require more transportation investment?
  - What transportation modes need more investment and why?
  - Are there an adequate number of available financing mechanisms for transportation system investment in your region?
  - What types of funding mechanisms are available?
  - Are projects adequately funded?
  - Would increased transportation investment increase your business' productivity? Describe how.
- If mobility levels and transportation maintenance levels were to decline from their current condition, what business impacts do you foresee?
- Would you consider relocating your business outside of the state if transportation maintenance and mobility levels were to decline? What is your tolerance threshold?
- Would you be willing to use a toll road for your business operations if it avoids congestion, provides greater reliability, and lowers fuel costs? What level of toll pricing would be reasonable? How would toll pricing improve your bottom line or increase productivity?

Follow-Up Questions

As we proceed with the interviews, CS will be able to tailor the follow-up questions with specific detail based on the participants' initial responses. Additional follow-up questions may also include other questions specifically related to regional bottlenecks, funding limitations, specific examples of regional transportation needs and funding gaps, among others.